

• 15P0071B5 •

ASAC

COMPACT SOFT STARTER

USER MANUAL -OPERATION GUIDE-

Agg. 05/07/04
R. 01

English

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
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- Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of BCH ELECTRIC LTD.
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1 CAUTION STATEMENTS



This symbol is used throughout this manual to draw attention to topics of special importance to the installation and operation of the ASAC Series soft starter.

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is therefore the installer's responsibility to adhere to all instructions in this manual, to follow good electrical practice and to seek advice before operating this equipment in a manner other than as detailed in this manual.

- Ensure that the ASAC is completely isolated from the power supply before attempting any work on the unit.
- Do not apply incorrect voltages to the control input terminals.
- Ensure cables to the control inputs are segregated from AC power and control wiring.
- Some electronic contactor coils are not suitable for direct switching with PCB mount relays. Consult the contactor manufacturer/supplier to see if this is advisable.
- Do not connect Power Factor Correction capacitors to the output of ASAC Series soft starters. If static power factor correction is employed, it must be connected to the supply side of the soft starter.

The examples and diagrams in this manual are included solely for illustrative purposes. Users are cautioned that the information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct or indirect or consequential damages resulting from the use or application of this equipment.



CAUTION

GROUNDING AND BRANCH CIRCUIT PROTECTION

It is the responsibility of the user or person installing the ASAC to provide proper grounding and branch circuit protection according to the IEC rules and local codes.



DANGER

WARNING - ELECTRICAL SHOCK HAZARD

ASAC Series soft starter contains dangerous voltages when connected to line voltage. Only a competent electrician should carry out the electrical installation. Improper installation of the motor or the ASAC may cause equipment failure, serious injury or death. Follow this manual, IEC rules and local safety codes.



CAUTION

SHORT CIRCUIT

The ASAC is not short circuit proof. Therefore, after severe overload or short circuit, the operation of the starter should be fully tested.

2 SERIES OVERVIEW

2.1 OVERVIEW

The ASAC Series comprises two separate ranges, ASAC-0 and ASAC-1. These ranges share common power and mechanical designs but offer different features sets. These ranges include an internal bypass function that bypass the soft starter SCRs during run. This allows the ASAC to be installed in a non-ventilated enclosure without the need for an external bypass contactor.

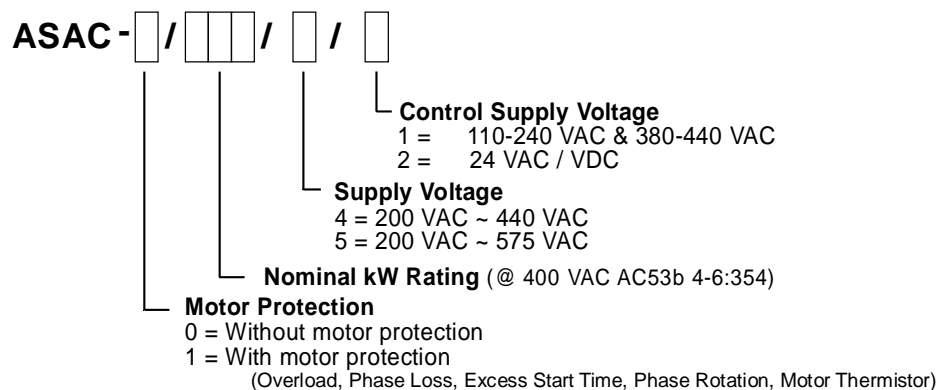
2.2 Feature list

| Feature | ASAC- 0 | ASAC-1 |
|---|---------|--------|
| Starting | | |
| Timed Voltage Ramp | | |
| Current Limit | | |
| Current Ramp | | |
| Stopping | | |
| Coast To Stop | | |
| Soft Stop | | |
| Protection | | |
| Motor Overload | | |
| Phase Loss | | |
| Excess Start Time | | |
| Phase Sequence | | |
| Motor Thermistor | | |
| Power Circuit Fault | | |
| Supply Frequency | | |
| Communications Failure | | |
| Interface | | |
| Fixed Relay Output (Main Contactor Relay) | | |
| Programmable Relay (Trip or Run) | | |
| Accessories | | |
| Remote Operator | | |
| MODBUS Interface | | |
| Profibus Interface | | |
| DeviceNet Interface | | |
| AS-I Interface | | |
| PC Set-up Software | | |

= Standard

= Optional

2.3 Part Number Format



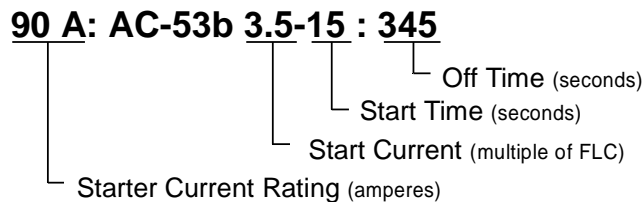
3 SPECIFICATIONS

3.1 CURRENT RATINGS

| | Maximum overload 400% FLC AC53b 4-6:354 <1000 metres | Maximum overload 450% FLC AC53b 4-20:340 <1000 metres |
|----------|---|--|
| | FLC | FLC |
| ASAC-007 | 18 A | 17 A |
| ASAC-015 | 34 A | 30 A |
| ASAC-018 | 42 A | 36 A |
| ASAC-022 | 48 A | 40 A |
| ASAC-030 | 60 A | 49 A |
| | AC53b 4-6:594 <1000 metres | AC53b 4-20:580 <1000 metres |
| ASAC-037 | 75 A | 65 A |
| ASAC-045 | 85 A | 73 A |
| ASAC-055 | 100 A | 96 A |
| ASAC-075 | 140 A | 120 A |
| ASAC-090 | 170 A | 142 A |
| ASAC-110 | 200 A | 165 A |

FLC: maximum motor Full Load Current

AC53 b Utilization Category Format



Starter Current Rating: The Full Load Current rating of the soft starter given the parameters detailed in the remaining sections of the utilization code.

Start Current: The maximum available start current given the parameters detailed in the remaining sections of the utilisation code.

Start Time: The maximum available start time given the parameters detailed in the remaining sections of the utilisation code.

Off Time: The minimum allowable time between the end of one start and the beginning of the next start given the parameters detailed in the remaining sections of the utilisation code.

Contact your local supplier ratings under operating conditions not covered by the above ratings charts.

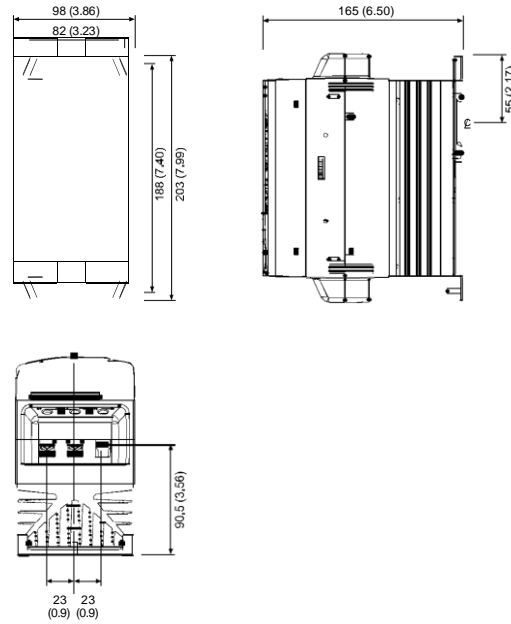
3.2 APPLICABLE MOTOR RATINGS

| Soft Starter Model | Applicable motor power | | | | | FLC* |
|---------------------------|------------------------|------------------|--------------|------------------|--------------|------|
| | 200-240Vac kW | 380-415Vac kW | 440Vac kW | 460-500Vac kW | 575Vac kW | A |
| ASAC-0/ASAC-1 007 | 4,5 | 9,2 | 9,2 | 11 | 11 | 18 |
| ASAC-0/ASAC-1 015 | 9,2 | 15 | 18,5 | 18,5 | 22 | 34 |
| ASAC-0/ASAC-1 018 | 11 | 18,5 | 22 | 22 | 30 | 42 |
| ASAC-0/ASAC-1 022 | 11 | 22 | 30 | 30 | 37 | 48 |
| ASAC-0/ASAC-1 030 | 15 | 30 | 37 | 37 | 45 | 60 |
| ASAC-0/ASAC-1 037 | 22 | 37 | 45 | 45 | 55 | 75 |
| ASAC-0/ASAC-1 045 | 22 | 45 | 55 | 55 | 55 | 85 |
| ASAC-0/ASAC-1 055 | 30 | 55 | 55 | 55 | 75 | 100 |
| ASAC-0/ASAC-1 075 | 45 | 75 | 75 | 90 | 110 | 140 |
| ASAC-0/ASAC-1 090 | 55 | 90 | 90 | 110 | 132 | 170 |
| ASAC-0/ASAC-1 110 | 55 | 110 | 110 | 132 | 160 | 200 |
| Soft starter power supply | 200-440Vac | | | 460-575Vac | | |

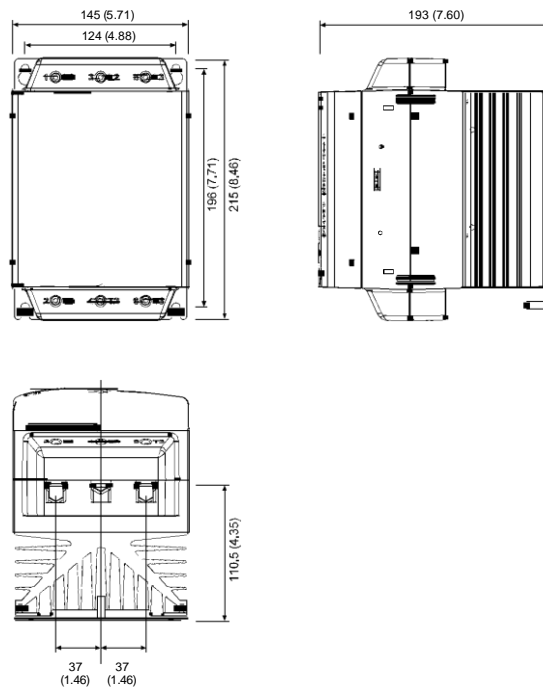
*FLC: maximum motor Full Load Current at 40° C environmental temperature.

3.3 Dimensions & Weights

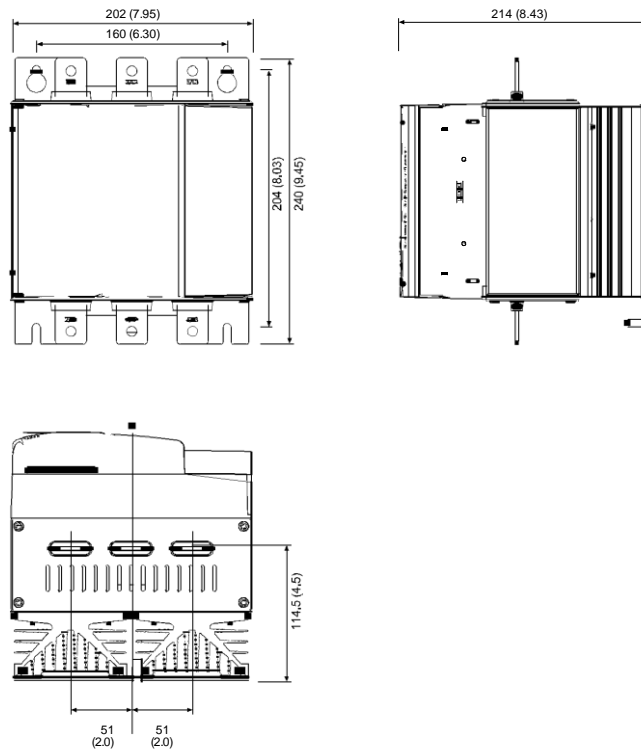
ASAC-0/007 ~ ASAC-0/030 (2.0kg)
ASAC-1/007 ~ ASAC-1/030 (2.1kg)



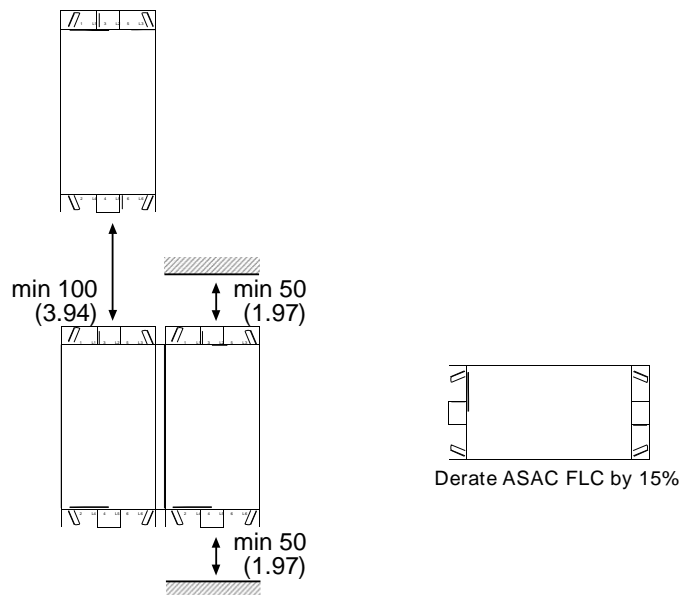
ASAC-0/037 ~ ASAC-0/055 (4.0kg)
ASAC-1/037 ~ ASAC-1/055 (4.3kg)



ASAC-0/075 ~ ASAC-0/110 (6.1kg)
ASAC-1/075 ~ ASAC-1/110 (6.8kg)



3.4 Mounting







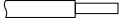
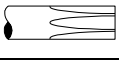

3.5 Fuses

The fuses can be used with the ASAC Series soft starter to reduce the potential for damage to SCRs from transient overload currents and for Type 2 coordination. Suitable Bussman & Ferraz semiconductor fuses are detailed below.

| ASAC Model | SCR I ² t (A ² s) | European/IEC Style (North American Style) | Bussman Fuse |
|------------|---|---|---------------------|
| 007 | 1150 | 6 .6 URD3 0xxxA006 3 (A070URD3 0xxx006 3) | 170M-13 14 (50 A) |
| 015 | 8 000 | 6 .6 URD3 0xxxA0125 (A070URD3 0xxx0125) | 170M-13 17 (100 A) |
| 018 | 10500 | 6 .6 URD3 0xxxA016 0 (A070URD3 0xxx016 0) | 170M-13 18 (125 A) |
| 022 | 15000 | 6 .6 URD3 0xxxA016 0 (A070URD3 0xxx016 0) | 170M-13 18 (125 A) |
| 03 0 | 18 000 | 6 .6 URD3 0xxxA016 0 (A070URD3 0xxx016 0) | 170M-13 19 (16 0 A) |
| 03 7 | 51200 | 6 .6 URD3 0xxxA0250 (A070URD3 0xxx0250) | 170M-13 21 (250 A) |
| 045 | 8 0000 | 6 .6 URD3 0xxxA03 15 (A070URD3 0xxx03 15) | 170M-13 21 (250 A) |
| 055 | 9 7000 | 6 .6 URD3 0xxxA03 15 (A070URD3 0xxx03 15) | 170M-13 21 (250 A) |
| 075 | 16 8 000 | 6 .6 URD3 1xxxA0450 (A070URD3 1xxx0450) | 170M-13 22 (3 15 A) |
| 09 0 | 245000 | 6 .6 URD3 1xxxA0450 (A070URD3 1xxx0450) | 170M-3 022 (550 A) |
| 110 | 3 20000 | 6 .6 URD3 1xxxA0450 (A070URD3 1xxx0450) | 170M-3 022 (550 A) |

xxx = Blade Type.
Refer Ferraz for options.

3.6 Power terminators

| | L1/1, L2/3, L3/5, T1/2, T2/4, T3/6 mm ² (AWG) | | | A1, A2, A3, 01, 02, B4, B5, 13, 14, 23, 24 mm ² (AWG) | |
|---|---|---|-----------|--|--|
| | 007 ~ 030 | 037 ~ 055 | 075 ~ 110 | 007 ~ 110 | |
|  | 10 - 35 (8 - 2)  | 25 - 50 (4 - 1/0)  | N.A. | 11 (0.43) 26 Ø 8.5 (1.02) (0.33) | 0.14 - 1.5 (26 - 16)  |
|  | 10 - 35 (8 - 2) 14 (0.55) mm (inch) | 25 - 50 (4 - 1/0) 14 (0.55) mm (inch) | N.A. | 0.14 - 1.5 (26 - 16) 6 (0.24) mm (inch) | |
|  | Torx (T20) 3 - 5 Nm 2.2 - 3.7 ft-lb | Torx (T20) 4 - 6 Nm. 2.9 - 4.4 ft-lb | N.A. | N.A. | |
|  | 7 mm 3 - 5 Nm 2.2 - 3.7 ft-lb | 7 mm 4 - 6 Nm 2.9 - 4.4 ft-lb | N.A. | 3.5 mm 0.5 Nm max 4.4 lb-in max | |

75°C Wire Use copper conductors only

3.7 General Technical Data

| | |
|---|--|
| Mains supply (L1, L2, L3): | |
| ASAC/xxx/4/x | 3 x 200 VAC ~ 440 VAC (+10% / - 15%) |
| ASAC/xxx/5/x | 3 x 200 VAC ~ 575 VAC (+10% / - 15%) |
| Supply frequency (at start) | 45Hz to 66 Hz |
| Rated insulation voltage | 600 VAC |
| Rated impulse withstand voltage | 4 kV (1, 2/ 50µs at 2000 m) |
| Form designation | Bypassed semiconductor motor starter form 1 |
| Control supply (A1, A2, A3): | |
| ASAC/xxx/x/1 | 110-240VAC (+10% / - 15%) or 380-440 VAC (+10% / - 15%) |
| ASAC/xxx/x/2 | 24 VAC/VDC (±20%) |
| Control Inputs | |
| Start Terminal N1 | Normally Open, 300 VAC max. |
| Stop Terminal N2 | Normally Closed, 300 VAC max. |
| Relay Outputs | |
| Main Contactor (Terminals 13 & 14) | Normally Open 6 A, 30 VDC resistive / 2 A, 400 VAC, AC11 |
| Programmable Relay (Terminals 23 & 24) | Normally Open 6 A, 30 VDC resistive / 2 A, 400 VAC, AC11 |
| Environmental | |
| Degree of protection ASAC-007 to ASAC-055 | IP20 |
| Degree of protection ASAC-075 to ASAC-110 | IP00 |
| Operating Temperatures | -10 °C to + 60 °C |
| Humidity | 5% to 95% Relative Humidity |
| Pollution Degree | Pollution Degree 3 |
| Vibration | IEC 60068 Test Fc Sinusoidal 4Hz to 13.2Hz: ± 1mm displacement 13.2Hz to 200Hz: ± 0.7g |
| EMC Emission | |
| Equipment class (EMC) | Class A |
| Conducted radio frequency emission | 0.15 MHz to 0.5 MHz : <90dB(µV) 0.5 MHz to 5 MHz : <76dB(µV) 5 MHz to 30 MHz : 80-60dB(µV) |
| Radiated radio frequency emission | 30 MHz to 230 MHz : <30dB(µV/m) 230 MHz to 1000 MHz : <37dB(µV/m) |
| This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods. | |
| EMC Immunity | |
| Electro static discharge | 4 kV contact discharge, 8 kV air discharge |
| Radio-frequency electromagnetic field | 0.15 MHz to 1000 MHz: 140dB(µV) |
| Fast transients 5/50 ns (Main & control circuits) | 2 kV / 5.0 kHz |
| Surges 1.2/50 µs – 8/20 ms (Main & control circuits)..... | 2 kV line to earth, 1 kV line to line |
| Voltage dip and short time interruption | 5000 ms (at 0% nominal voltage) |

| | |
|--|------------------|
| Short Circuit | |
| Rated short-circuit current ASAC-007 to ASAC-037 | 5 kA |
| Rated short-circuit current ASAC-045 to ASAC-110 | 10 kA |
| Heat Dissipation | |
| During Start | 3 watts / Ampere |
| During Run | < 4 watts |
| Standards Approvals | |
| C | IEC 60947-4-2 |
| UL / C-UL | UL508 |
| CE | IEC 60947-4-2 |
| CCC | GB 14048.6 |

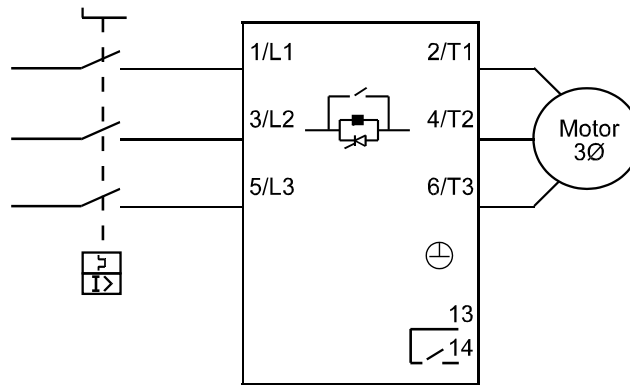
4 ASAC-0 SERIES

4.1 Overview

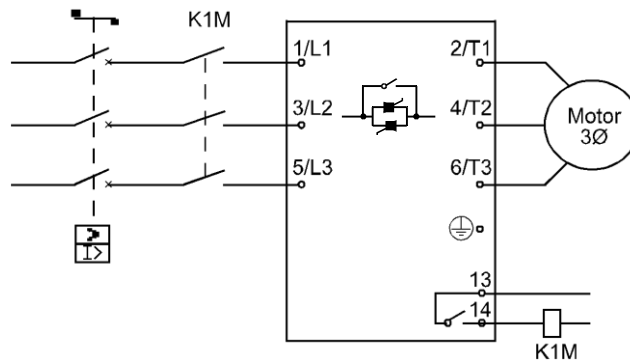
ASAC-0 starters provide soft start and soft stop control. They are designed to be used with an external motor protection device.

4.2 Electrical schematics

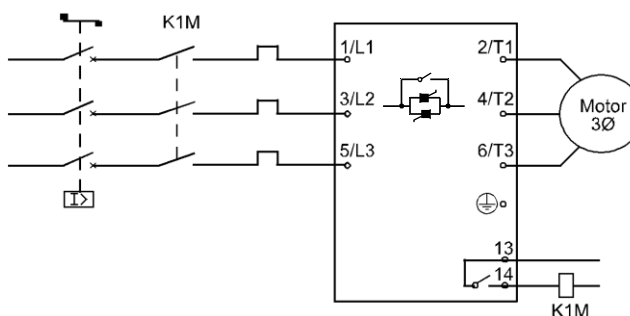
Example 1. ASAC-0 Series starter installed with a motor protection circuit breaker.



Example 2. ASAC-0 Series starter installed with motor protection circuit breaker and line contactor.



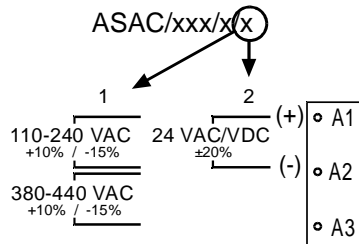
Example 3. ASAC-0 Series starter installed with system protection circuit breaker, separate overload and line contactor.



4.3 Control voltage

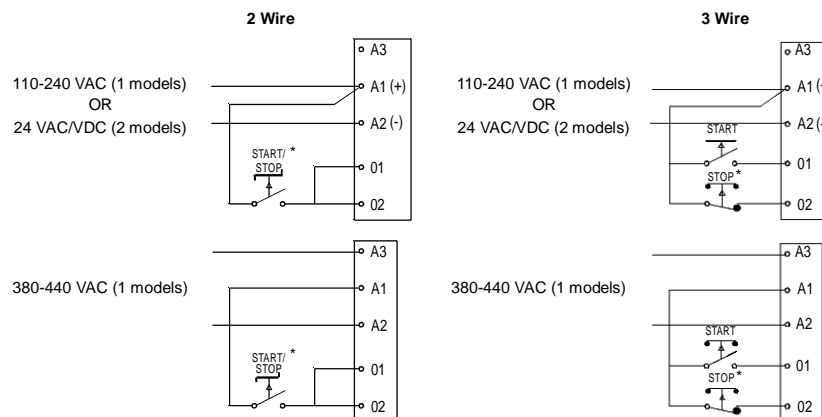
ASAC-0 Series can be supplied in either of two control voltage configurations.

ASAC-0/xxx/x/1 110-240VAC (+ 10% / - 15%) or 380-440 VAC (+ 10% / - 15%)
ASAC-0/xxx/x/2 24 VAC/VDC (± 20%)



WARNIG: Always apply control voltage before (or with) mains voltage.

4.4 Control circuits

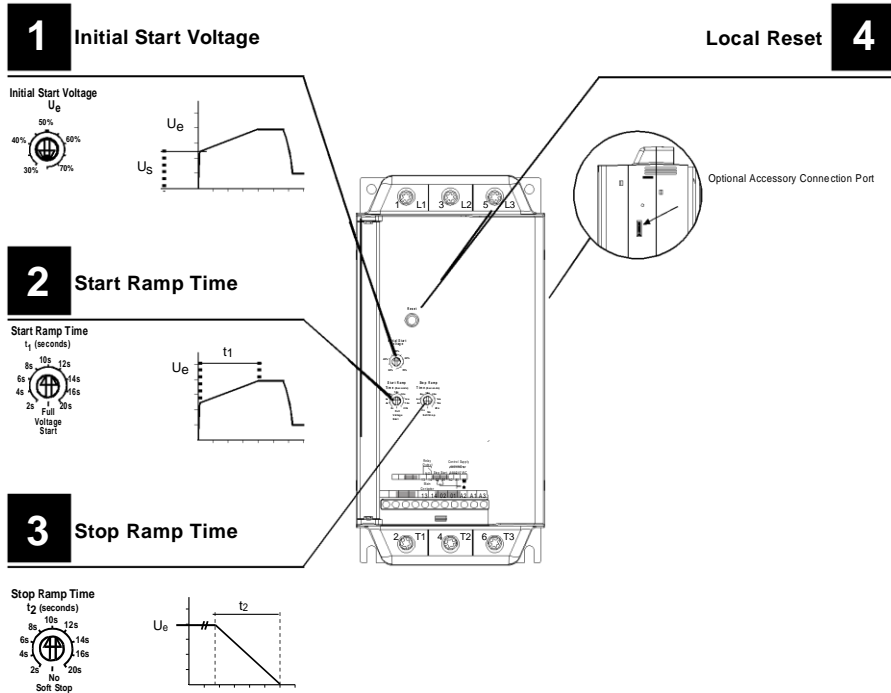


* Also resets trip states.

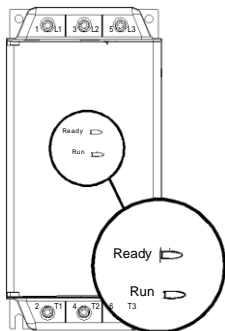


CAUTION: With 24Vac/Vdc use contacts rated for low voltage and low current (gold flash or similar).

4.5 Trimming



4.6 Led



| LED Status | Ready | Run |
|------------|------------------|-----------------------------|
| Off | No control power | Motor not running |
| On | Ready | Motor running at full speed |
| Flash | Starter tripped | Motor starting or stopping |

4.7 Diagnostic trip codes

| Ready LED | Description |
|-----------|---|
| ● x 1 | Power Circuit: Check mains supply L1, L2 & L3, motor circuit T1, T2 & T3 and soft starter SCRs. |
| ● x 6 | Supply Frequency: Check supply frequency is in range. |
| ● x 8 | Network Comms Failure (between accessory module and network): Check network connections and settings. |
| ● x 9 | Starter Comms Failure (between starter and accessory module): Remove and refit accessory module. |

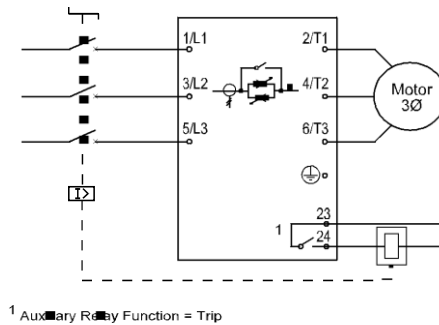
5 ASAC-1 SERIES

5.1 Overview

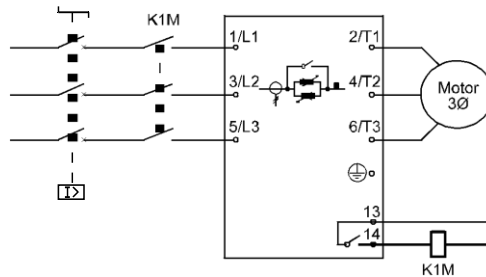
ASAC-1 starter provide current limit soft start, soft stop and a range of motor protection functions.

5.2 Electrical schematics

Example 1. ASAC-1 Series starter installed with system protection circuit breaker complete with a shunt trip device.



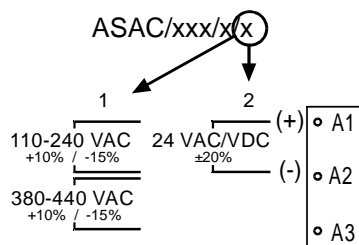
Example 2. ASAC-1 Series starter installed with a system protection circuit breaker and line contactor.



5.3 Control voltage

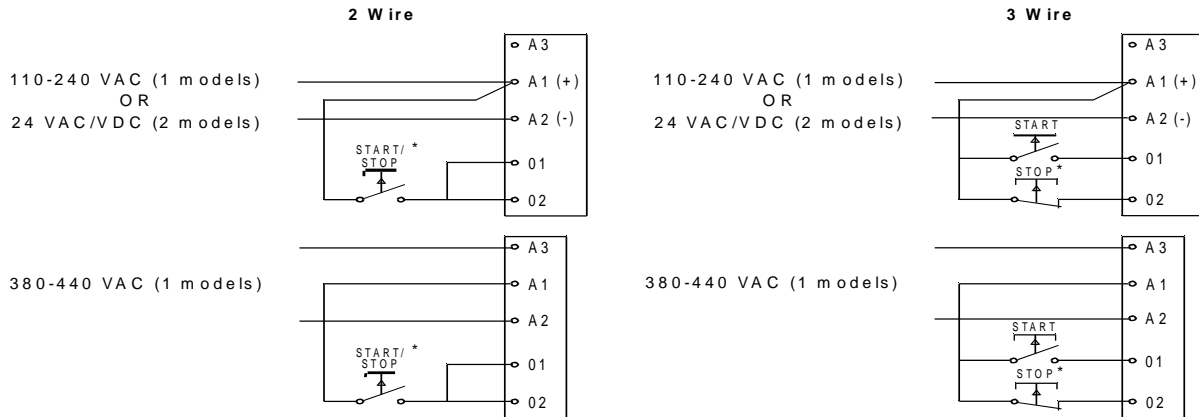
ASAC-1 Series can be supplied in either of two control voltage configurations.

ASAC-1/xxx/x/1 110-240VAC (+ 10% / - 15%) or 380-440 VAC (+ 10% / - 15%)
ASAC-1/xxx/x/2 24 VAC/VDC ($\pm 20\%$)



WARNIG: Always apply control voltage before (or with) mains voltage.

5.4 Control circuits



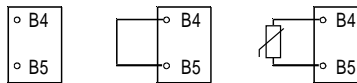
* Also resets trip states.



CAUTION: With 24Vac/Vdc use contacts rated for low voltage and low current (gold flash or similar).

5.5 Motor thermistor

Motor thermistors (if any) can be connected directly to the ASAC-1 terminals B4 & B5. If no motor thermistors are connected there must be a link between B4 & B5.



5.6 TRIMMING

1 Motor Flc

Motor FLC (% Soft Starter FLC) = $\frac{\text{Motor FLC}}{\text{ASAC FLC}}$

| ASAC series | ASAC FLC (A) (VFD-NT, 0-1000V) |
|-------------|--------------------------------|
| ASAC-1 | 1.5 |
| ASAC-2 | 2.5 |
| ASAC-3 | 4.0 |
| ASAC-4 | 6.3 |
| ASAC-5 | 10.0 |
| ASAC-6 | 16.0 |
| ASAC-7 | 25.0 |
| ASAC-8 | 40.0 |
| ASAC-9 | 63.0 |
| ASAC-10 | 100.0 |

2 Current Ramp

Current Ramp (% FLC / Ramp Time) I_R / t_1 (Seconds)

3 Current Limit

Current Limit (% FLC)

4 Motor Trip Class

Cold Start Curves

Class 20
Class 10

OFF = No overload protection

5 Local Reset

6 Soft Stop Time

Stop Time t_2 (seconds)

7 Excess Start Time

Excess t_3 (seconds)

8 Phase Sequence Protection

Phase Sequence Protection

9 Auxiliary Relay Function

Auxiliary Relay Function

8 9 Example

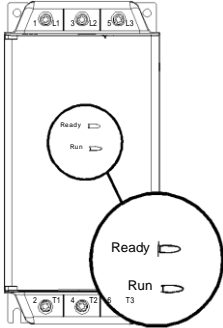
Phase Sequence = ANY

Phase Sequence = FWD

Trip Run
Aux Relay = Trip

Trip Run
Aux Relay = Run

5.7 Led



| LED Status | Ready | Run |
|------------|------------------|-----------------------------|
| Off | No control power | Motor not running |
| On | Ready | Motor running at full speed |
| Flash | Starter tripped | Motor starting or stopping |

5.7.1 Diagnostic Trip codes

| Ready LED | Description |
|-----------|--|
| ● x 1 | Power Circuit: Check mains supply L1, L2 & L3, motor circuit T1, T2 & T3 and soft starter SCRs. |
| ● x 2 | Excess Start Time: Check load, increase Current Limit or adjust Excess Start Time setting. |
| ● x 3 | Motor Overload: Allow motor to cool, reset soft starter and restart. Soft starter cannot be reset until motor has cooled adequately. |
| ● x 4 | Motor Thermistor: Check motor ventilation and thermistor connection B4 & B5. Allow motor to cool. |
| ● x 5 | Phase Imbalance: Check line current L1, L2 & L3. |
| ● x 6 | Supply Frequency: Check supply frequency is in range. |
| ● x 7 | Phase Sequence: Check for correct phase sequence. |
| ● x 8 | Network Comms Failure (between accessory module and network): Check network connections and settings. |
| ● x 9 | Starter Comms Failure (between starter and accessory module): Remove and refit accessory module. |

6 REMOTE OPERATOR

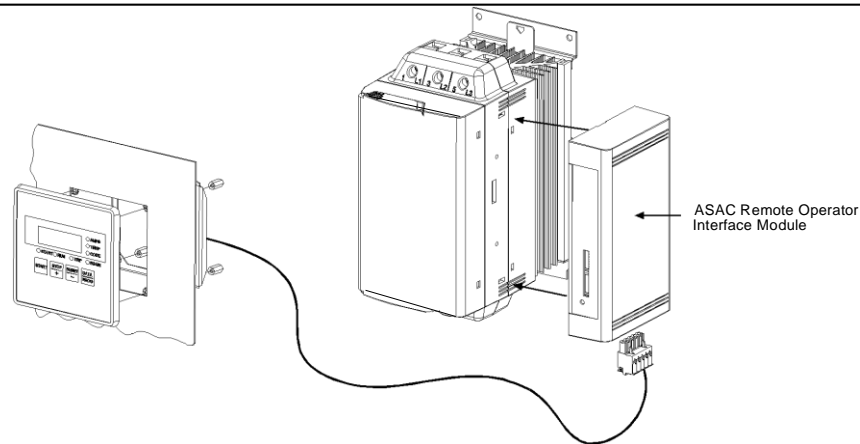
Part number: ZZ0071700 REMOTE OPERATOR


Part number: ZZ0071003 Remote operator interface module (AP ASCII)

Part number: ZZ0071004 Kit Remote operator interface module (AP ASCII) + REMOTE OPERATOR

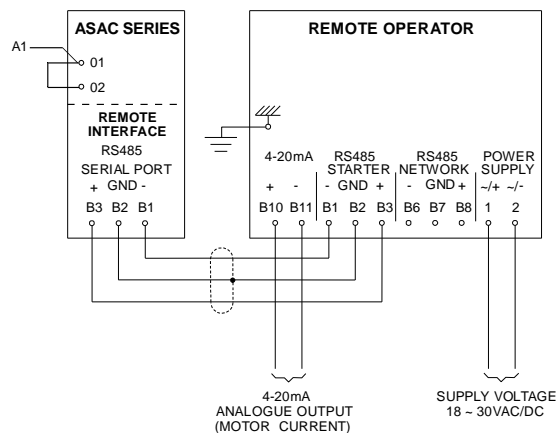
The Basic Set-up Procedure describes the installation and connection procedures required for basic control and remote indication of ASAC Series soft starters. To make use of the more advanced ASAC Remote Operator functions consult the other sections of this manual.


6.1 Installation



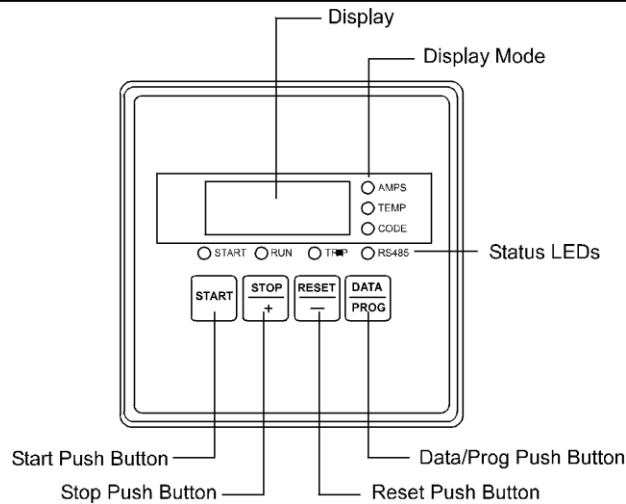
1. Connect the ASAC Remote Operator Interface Module to the ASAC soft starter.
 **CAUTION** Control power and mains supply must be removed from the ASAC before attachment or removal of accessory modules. Failure to do so may result in equipment damage.
2. Cut a 92mm² hole in the panel and fit the ASAC Remote Operator.
3. Wire between the Remote Operator and ASAC as shown below.

6.2 Connection



-  **CAUTION** First application of control voltage to the ASAC will start the motor. Operational control is then possible via the ASAC Remote Operator. Ensure it is safe to start the motor when implementing the circuit above.

6.3 OPERATION



Start Push Button: Starts the motor.

Stop Push Button: Stops the motor

Reset Push Button: Resets the ASAC

Data/Prog Push Button: Select the data type to be shown on the display (Motor Current or Motor Temperature)

Display Mode: Indicates data type shown on the display.

Motor Current

Motor Temperature

Trip Code.

Display: Indicates the value of the currently selected data.



CAUTION

Motor current and motor temperature are only available when the Remote Operator is connected to ASAC-1 models. If connected to a ASAC-0 model, the display will be show 1.11 instead of motor temperature and 2222 instead of motor current.

Status LEDs: Indicates status of the ASAC and the RS485 link between the Remote Operator and ASAC.



CAUTION

Simultaneously pressing the Stop and Reset pushbuttons initiates a quick stop, which immediately removes voltage from the motor, ignoring any soft stop time set on the ASAC soft starter.

6.4 Trip Codes

| Code | Description | ASAC-0 | ASAC-1 |
|------|------------------------|--------|--------|
| 1-1 | Excess Start Time | | |
| 1-2 | Motor Overload | | |
| 1-3 | Motor Thermistor | | |
| 1-4 | Phase Imbalance | | |
| 1-5 | Supply Frequency | | |
| 1-6 | Phase Sequence | | |
| 1-8 | Power Circuit | | |
| 1-C | Communications Failure | | |

6.5 Overview

The ASAC Remote Operator can control and monitor ASAC Series soft starter performance. Functionality includes:

- Push Button Control (Start, Stop, Quick Stop & Reset)
- ASAC Status LEDs (Start, Run & Trip)
- Communication Status LED
- Motor Data Display (motor current & temperature)¹
- ASAC Trip Code Display
- 4-20mA Output (motor current)¹

¹ = ASAC-1 models only.

The ASAC Remote Operator can also act as a gateway device for connection to a Modbus RTU or AP ASCII network.

6.6 Warnings

The Remote Operator allows remote operation of the soft starter. Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without Warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

Use all International recognised standard practice for RS485 communications when installing and using this equipment.

Users are cautioned that the information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

6.7 General Technical Data

| Enclosure | |
|-----------------------------------|--------------------|
| Front Panel Height | 120 mm |
| Front Panel Width | 120 mm |
| Inside Panel Depth (when mounted) | 30 mm (max) |
| Panel Cut-out | 92 mm ² |
| Weight | 450 g |

| Power Supply | |
|-----------------------------|---|
| Voltage | 18 – 30 V DC or AC (50/60Hz) |
| Consumption | 250 mA (max) |
| Connection (Terminals 1, 2) | 2 pole spring clamp connector terminals |

| RS485 Serial Network Port (This Network Connection is Optional) | |
|---|--|
| RS485 Network Interface | AP ASCII or Modbus RTU protocol (selectable) |
| Connection (Terminals B6, B7, B8) | 3 pole spring clamp connector terminals |

| RS485 Serial Starter Port (Soft Starter Connection) | |
|---|---|
| RS485 Soft Starter Interface | AP ASCII protocol as standard |
| Connection (Terminals B1, B2, B3) | 3 pole spring clamp connector terminals |

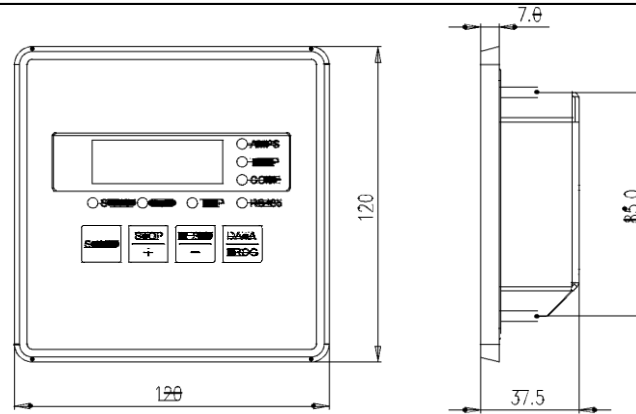
| Analogue Output | |
|------------------------------------|---|
| Motor Current Monitoring Interface | 4 - 20 mA (max.burden 200 Ω) |
| Connection (Terminals B10, B11) | 2 pole spring clamp connector terminals |

| Sundry | |
|-----------------------|--|
| Enclosure Rating | IP54 or NEMA 12 when correctly panel mounted |
| Pollution degree | Pollution Degree 3 |
| Operating Temperature | - 5°C / + 60°C |
| Relative Humidity | 5 – 95% (max non condensing) |

This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.

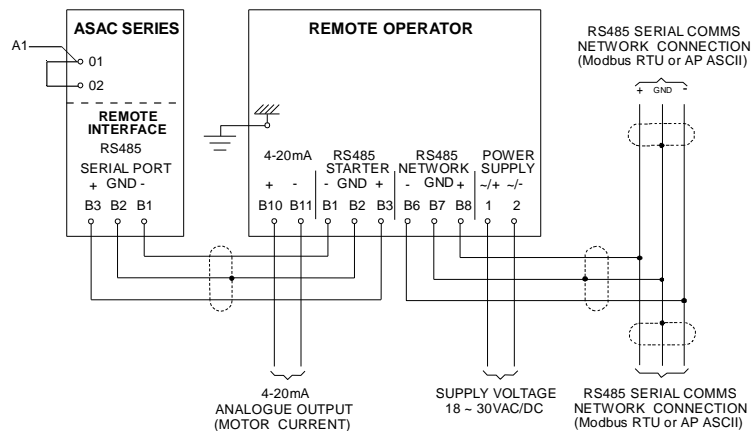
| Standards Approvals | |
|---------------------|---------------|
| CE | IEC 60947-4-2 |
| UL and C-UL | UL 508 |
| C | IEC 60947-4-2 |

6.8 Dimensions



6.9 Connection

This section details how to connect the ASAC Remote Operator to a RS485 serial communications network using either AP ASCII or Modbus RTU protocols.



Grounding and Shielding.

Twisted pair data cable with earth shield is recommended. The cable shield should be connected to a GND device terminal at both ends and one point of the site protective earth.

Termination Resistors.

In long cable runs prone to excessive noise interference, termination resistors should be installed. This resistance should match the cable impedance (typically 120 Ω). Do not use wire wound resistors.

RS485 Data Cable Connection.

Daisy chain connection is recommended. This is achieved by parallel connections of the data cable at the actual device terminals.

Remote Operator RS485 Network Connection Specifications.

Input Impedance: 12 K Ω

Common Mode Voltage range: -7 to +12 V

Input Sensitivity: +/- 200 mV

Minimum Differential Output Voltage: 1.5 V (with max. loading of 54 Ω)

6.10 Configuration

The ASAC Remote Operator must be configured to operate on the network. When configuring the ASAC Remote Operator the unit must be powered up with the soft starter in the "off" mode.

Programming Procedure

1. Enter program mode by holding down the [DATA/PROG] pushbutton for 4 seconds. The value of the first parameter will be displayed.
2. If required, adjust the parameter value using the [START/+] and or [STOP/-] pushbuttons.
3. Confirm the setting and move to the next parameter by pressing the [DATA/PROG] pushbutton.
4. Repeat steps 2 & 3 until all parameters have been set. The ASAC Remote Operator will automatically exit programming mode when the last parameter value has been set or if the keypad is left inactive for more than 20 seconds.

| Parameter | Description | Default Setting | Adjustable Range |
|-----------|---------------------------------|-------------------|---|
| 1 | RS485 Network Baud Rate | 4 (9600 baud) | 2 = 2400 baud 3 = 4800 baud 4 = 9600 baud 5 = 19200 baud 6 = 38400 baud |
| 2 | RS485 Network Satellite Address | 20 | 1 to 99 |
| 3 | RS485 Network Time Out | 0 seconds (= off) | 0 to 100 seconds |
| 4 | RS485 Network Protocol | 1 (AP ASCII) | 1 = AP ASCII protocol 2 = Modbus RTU protocol |
| 5 | Modbus Protocol Parity | 0 (no parity) | 0 = no parity 1 = odd parity 2 = even parity |
| 6 | Motor FLC | 10 A | 1 to 2868 A |
| 7 | Analogue Output 4mA Offset | 100% | 80 to 120% |

6.11 Modbus RTU

¹ Only available from ASAC-1 units.

MODBUS HEX Functions

Two functions are supported:
03 (Multiple Read)
06 (Single write)
The ASAC Series does not accept broadcast functions

| Address | Function | Type | Description |
|---------|----------------|-------|--|
| 40002 | Command | Write | 1=Start 2=Stop 3=Reset 4=Quick Stop 5=Forced Comms Trip |
| 40003 | Starter Status | Read | Bit 0-3 Description 0=Not used 1=Ready 2=Starting 3=Running 4=Stopping 6=Tripped |
| | | | 4 1=Forward Phase Sequence |
| | | | 5 Unallocated |
| | | | 6 Unallocated |
| | | | 7 Unallocated |
| 40004 | Trip Code | Read | 255=No Trip 1=Excess start time ¹ 2=Motor overload ¹ 3=Motor thermistor ¹ 4=Phase imbalance ¹ 5=Supply frequency 6=Phase sequence ¹ 8= Power circuit 16=Comms failure |
| 40005 | Current | Read | ¹ |
| 40006 | Temp | Read | ¹ |



CAUTION

Command, Starter Status, Trip Code, Current and Temperature must be sent individually. ie one data word request at a time

Examples

Command: Start

| Message | Starter Address | Function Code | Register Address | Data | CRC |
|---------|-----------------|---------------|------------------|------|------------|
| In | 20 | 06 | 40002 | 1 | CRC1, CRC2 |
| Out | 20 | 06 | 40002 | 1 | CRC1, CRC2 |

Starter Status: ASAC Running

| Message | Starter Address | Function Code | Address / Bytes Read | Number / | CRC |
|---------|-----------------|---------------|----------------------|----------|------------|
| In | 20 | 03 | 40003 | 1 | CRC1, CRC2 |
| Out | 20 | 03 | 2 | xxxx0011 | CRC1, CRC2 |

Trip Code: Motor overload

| Message | Starter Address | Function Code | Address / Bytes Read | Number / Value | CRC |
|---------|-----------------|---------------|----------------------|----------------|------------|
| In | 20 | 03 | 40004 | 1 | CRC1, CRC2 |
| Out | 20 | 03 | 2 | 00000010 | CRC1, CRC2 |

6.12 AP ASCII Protocol

The details of the message fragments used in communicating with the ASAC Remote Operator are shown in the table below. The message fragments may be assembled into complete messages as described in the sections that follow.



CAUTION

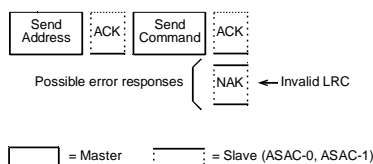
Data transmitted to and from the ASAC Remote Operator must be in 8 bit ASCII, no parity, 1 stop bit.

| Message Fragment Type | ASCII Character String or (Hexadecimal Character String) |
|----------------------------|--|
| Send Address | EOT [nn] [lrc] ENQ or (04h [nn] [lrc] 05h) |
| Send Command | STX [ccc] [lrc] ETX or (02h [ccc] [lrc] 03h) |
| Send Request | |
| Receive Data | STX [dddd] [lrc] ETX or (02h [dddd] [lrc] 03h) |
| Receive Status | STX [ssss] [lrc] ETX or (02h [ssss] [lrc] 03h) |
| ACK (acknowledge) | ACK or (06h) |
| NAK (negative acknowledge) | NAK or (15h) |
| ERR (error) | BEL or (07h) |

- nn = two byte ASCII number representing the soft starter address where each decimal digit is represented by n.
- lrc = two byte longitudinal redundancy check in hexadecimal.
- ccc = three byte ASCII command number where each character is represented by c.
- dddd = four byte ASCII number representing the current or temperature data where each decimal digit is represented by d.
- ssss= four byte ASCII number. The first two bytes are ASCII zero. The last two bytes represent the nibbles of a single byte of status data in hexadecimal.

Commands.

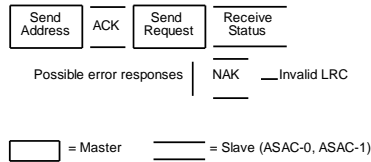
Commands can be sent to the ASAC Remote Operator using the following format:



| Command | ASCII | Comment |
|-------------------|-------|---|
| Start | B10 | Initiates a start |
| Stop | B12 | Initiates a stop |
| Reset | B14 | Resets a trip state |
| Coast to stop | B16 | Initiates an immediate removal of voltage from the motor. Any soft stop settings are ignored. |
| Forced comms trip | B18 | Causes a communications trip. |

Status retrieval.

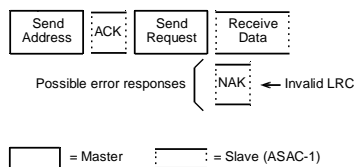
Starter status can be retrieved from the ASAC Remote Operator using the following format:



| Request | ASCII | Receive Status (ssss) | |
|----------------|-------|---|---|
| Trip Code | C18 | Requests the trip status of the ASAC-0, ASAC-1. 255 = No trip 1 = Excess start time ¹ 2 = Motor overload ¹ 3 = Motor thermistor ¹ 4 = Phase imbalance ¹ 5 = Supply frequency ¹ 6 = Phase sequence ¹ 7 = Electronic shearpin ¹ 8 = Power circuit fault 16 = Comms failure ¹ ASAC-1 models only. | |
| | | | |
| Starter Status | C22 | Bit No. | Description |
| | | 0 - 3 | 0 = Not used 1 = Waiting 2 = Starting (incl. Pre-start tests) 3 = Running 4 = Stopping 6 = Tripped |
| | | 4 | 1 = Forward phase sequence detected |
| | | 5 | Unallocated |
| | | 6 | Unallocated |
| | | 7 | Unallocated |

Data retrieval.

Data can be retrieved from the ASAC-1 Series soft starter via the ASAC Remote Operator using the following format:



| Request | ASCII | Receive Data (dddd) |
|-------------|-------|---|
| Current | D10 | Requests motor current. The data is 4 byte decimal ASCII. Minimum value 0000 A, maximum value 9999 A. |
| Temperature | D12 | Requests the calculated value of the motor thermal model as a % of Motor Thermal Capacity. The data is 4 byte decimal ASCII. Minimum value 0000%. Trip point 0105%. |

Calculating the check sum (LRC).

Each command string sent to and from the ASAC Remote Operator includes a check sum. The form used is the Longitudinal Redundancy Check (LRC) in ASCII hex. This is an 8-bit binary number represented and transmitted as two ASCII hexadecimal characters.

To calculate LRC:

1. Sum all ASCII bytes
2. Mod 256
3. 2's complement
4. ASCII convert

For example Command String (Start):

ASCII STX B 1 0
or 02h 42h 31h 30h

| ASCII | Hex | Binary | |
|-------|-----|-----------|--------------------|
| STX | 02h | 0000 0010 | |
| B | 42h | 0100 0010 | |
| 1 | 31h | 0011 0001 | |
| 0 | 30h | 0011 0000 | |
| | A5h | 1010 0101 | SUM (1) |
| | A5h | 1010 0101 | MOD 256 (2) |
| | 5Ah | 0101 1010 | 1's COMPLEMENT |
| | 01h | 0000 0001 | + 1 = |
| | 5Bh | 0101 1011 | 2's COMPLEMENT (3) |
| ASCII | 5 | B | ASCII CONVERT (4) |
| or | 35h | 42h | LRC CHECKSUM |

The complete command string becomes

ASCII STX B 1 0 5 B ETX
or 02h 42h 31h 30h 35h 42h 03h

To verify a received message containing an LRC:

1. Convert last two bytes of message from ASCII to binary.
2. Left shift 2nd to last byte 4 bits.
3. Add to last byte to get binary LRC.
4. Remove last two bytes from message.
5. Add remaining bytes of message.
6. Add binary LRC.
7. Round to one byte.
8. The result should be zero.

Response or status bytes are sent from the ASAC Remote Operator as an ASCII string.

STX [d1]h [d2]h [d3]h [d4]h LRC1 LRC2 ETX
d1 = 30h
d2 = 30h
d3 = 30h plus upper nibble of status byte right shifted by four binary places.
d4 = 30h plus lower nibble of status byte.

For example status byte = 1Fh, response is

STX 30h 30h 31h 46h LRC1 LRC2 ETX

6.13 4-20mA Output

The ASAC Remote Operator has a 4-20 mA analogue output for monitoring motor current.



CAUTION

The 4-20mA output is operational only when the Remote Operator is connected to ASAC-1 models.

Calibration The ASAC Remote Operator Motor FLC parameter (Par. 6) must be adjusted to match the Motor FLC setting in the soft starter. The 4 mA end of the analogue output signal can be calibrated using the Remote Operator Analogue Output 4 mA Offset parameter (Par. 7). This is set to give a 4 mA output signal when the motor current is zero.

Refer section 6.10 for the adjustment procedure.

The analogue output signal spans from 4 mA when the motor current is zero (ie, soft starter is not running) to 20 mA when the motor current is 125% of the Motor FLC setting in the Remote Operator parameter 6.

The 4-20 mA analogue output must only be used for motor current monitoring and metering. It is not designed for process signal control use.

6.14 Trouble Shooting

6.14.1 GENERAL FAULTS

| Indication | Problem | Possible Solution |
|---|--|---|
| No display | No control supply voltage. | Check that correct voltage is present at terminals 1 and 2. |
| Four dashes on display and RS485 LED flashing | A loss of communication has been detected on the RS485 link to the soft starter. | Verify and solve the cause for loss of communication. If communication is restored before a soft starter RS485 Time Out trip, the display will regain active status and the RS485 LED will illuminate. If communication is restored after a soft starter RS485 Time Out trip, the display will indicate a trip code. Use the Reset pushbutton to reset the soft starter fault. |
| nEt on display | A loss of communication has been detected on the RS485 link to the network. | The Remote Operator has an RS485 Network Time Out Protection setting (Parameter 3). This mode is entered when loss of communication is longer than this time setting. If communication is restored the system becomes active again. To clear nEt on the display, press the DATA/PROG pushbutton momentarily. |
| | Incorrect or no 4-20 mA analogue output signal | Check the correct voltage is present at terminals 1 and 2. Check that correct polarity is used at terminals B10 and B11. Check that Motor FLC and Analogue Output 4 mA Offset parameters are set correctly. |
| | The motor cannot be started. | Check that control voltage is connected to the ASAC, and that terminals 01 and 02 are linked and connected to A1. |

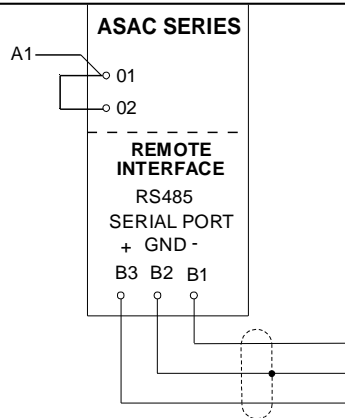
Part number: ZZ0071000



7.2 Adjustment

32/18

7.3 Connection



7.4 Modbus register

¹ Only available from ASAC-1 units.

| Address | Function | Type | Description |
|---------|----------------|-------|--|
| 40002 | Command | Write | 1=Start 2=Stop 3=Reset 4=Quick Stop 5=Forced Comms Trip |
| 40003 | Starter Status | Read | Bit 0-3 0=Not used 1=Ready 2=Starting 3=Running 4=Stopping 6=Tripped |
| | | | 4 1=Forward Phase Rotation |
| | | | 5 Unallocated |
| | | | 6 Unallocated |
| | | | 7 Unallocated |
| 40004 | Trip Code | Read | 255=No Trip 0=Shorted SCR 1=Excess start time ¹ 2=Motor overload ¹ 3=Motor thermistor ¹ 4=Phase imbalance ¹ 5=Supply frequency ¹ 6=Phase sequence ¹ 8= Power circuit 16=Comms failure |
| 40005 | Current | Read | ¹ |
| 40006 | Temp | Read | ¹ |

7.5 Modbushex Functions

Two functions are supported:

03 (Multiple Read)

06 (Single write)

The ASAC Series does not accept broadcast functions



CAUTION

Command, Starter Status, Trip Code, Current and Temperature must be sent individually. ie one data word request at a time.

Examples

Command: Start

| Message | Starter Address | Function Code | Register Address | Data | CRC |
|---------|-----------------|---------------|------------------|------|------------|
| In | 20 | 06 | 40002 | 1 | CRC1, CRC2 |
| Out | 20 | 06 | 40002 | 1 | CRC1, CRC2 |

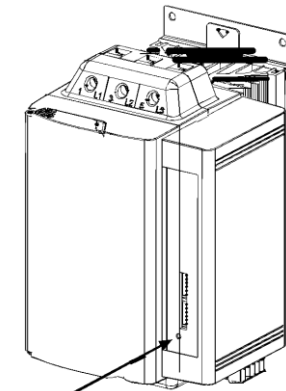
Starter Status: ASAC Running

| Message | Starter Address | Function Code | Address / Bytes Read | Number / Value | CRC |
|---------|-----------------|---------------|----------------------|----------------|------------|
| In | 20 | 03 | 40003 | 1 | CRC1, CRC2 |
| Out | 20 | 03 | 2 | xxxx0011 | CRC1, CRC2 |

Trip Code: Motor overload

| Message | Starter Address | Function Code | Address / | Number / | CRC |
|---------|-----------------|---------------|-----------|----------|------------|
| In | 20 | 03 | 40004 | 1 | CRC1, CRC2 |
| Out | 20 | 03 | 2 | 00000010 | CRC1, CRC2 |

7.6 Network status led



Network LED

| OFF | ON | FLASH |
|---------------|------------------------|-----------------------|
| No connection | Healthy communications | Communication failure |



CAUTION

When a communications failure occurs the Network Status LED will flash. When communications are restored the Network Status LED will cease flashing.



CAUTION

When a communications failure occurs, the ASAC will trip if the communication time out function has been set. When communications are restored the ASAC will require an independent reset.

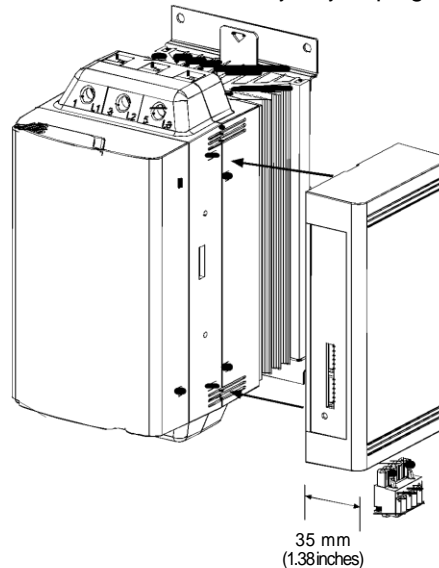
8 OTHERS ACCESSORIES

8.1 Overview

The ASAC Series includes a range of others accessories including

Profibus Interface
DeviceNet Interface
ASi Interface
PC Set up Software

The accessory items interface with the ASAC Series starters by way of plug in module.



CAUTION

Control power and mains supply must be removed from the ASAC Series soft starters before attachment or removal of accessory items. Failure to do so may result in equipment damage.

8.2 Profibus Module

Part Number: ZZ_-----

The Profibus Module can be used with both ASAC-0 and ASAC-1 models enable control and monitoring via a Profibus network.

Available 4nd Q uarter 2004

8.3 DeviceNet Module

Part Number: ZZ0071001

The DeviceNet Module can be used with both ASAC-0 and ASAC-1 models enable control and monitoring via a DeviceNet network.

Available 4nd Q uarter 2004

8.4 AS-i Module

Part Number: ZZ_-----

The AS-i Module can be used with both ASAC-0 and ASAC-1 models enable control and monitoring via a AS-i network.

Available 4nd Q uarter 2004

9 PC SET UP SOFTWARE

The PC Set Up Software can be used with ASAC-0, ASAC-1 and ASA soft starters to provide the following functionality for networks of up to 99 soft starters.

| Feature | ASAC-0 | ASAC-1 | ASA |
|--|--------|--------|-----|
| Operational Control (start, stop, reset, quick stop) | | | |
| Status monitoring (ready, starting, running, stopping, tripped) | | | |
| Performance monitoring (motor current, motor temperature) | | | |
| Upload parameter settings | | | |
| Download parameter settings | | | |

System Requirements

An x86-based personal computer (486 minimum, Pentium, or Pentium Pro). Pentium recommended.

A hard disk with 6 megabytes of free space.

A Microsoft Mouse or other compatible pointing device.

An EGA, VGA, or compatible display (VGA or higher is recommended).

32 MB of random-access memory (48 MB recommended)

Microsoft Windows 95/98/2000 and Windows NT or later

An RS485 communication port or RS232 to RS485 converter

Additionally, each ASAC Series soft start connected to the network must be fitted with an MODBUS Module (ZZ0071000).